Nitrogen mineralization is one of the most important soil N cycle processes in nature. Along with N immobilization, it is at the very heart of the energy producing decomposition process that drives the microbial engine in soils. Nitrogen mineralization is a complex process that involves a vast collection of microorganisms (bacteria, fungi, and actinomycetes) acting on a wide array of substrates (crop residues, soil humus, dead microbial tissue, and manure) under varying soil environments (temperature, water content, and aeration) to produce a remarkably simple product (NO$_3$-N) that can be used by plants, lost to the atmosphere as N gases, immobilized, accumulated in soil, or leached from the soil-crop system. Soil scientists have studied N mineralization for decades because it was widely recognized that understanding this fundamental process is crucial to the design of efficient N management strategies in order to achieve sustained crop productivity with minimal environmental impact.

The purposes of this chapter are to: (i) review some of the principles involved in studying N mineralization, (ii) provide an overview of selected field N mineralization techniques, and (iii) delineate the situations and circumstances where these techniques can provide useful information in designing more efficient N management strategies for crop production and environmental quality.

PRINCIPLES

Nitrogen mineralization is defined as the conversion of organic N to inorganic N as a result of microbial activity (Soil Science Society of America, 1987). Nitrogen immobilization is the corollary to mineralization and is defined as the conversion of inorganic N to the organic N form in microbial tissues (Soil Science Society of America, 1987). These deceptively simple definitions conceal a very complex underlying process.